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10/735,987	12/15/2003	Daniel R. Juliano	10001.002100 (NVLS 2848)	4161
31894	7590	02/07/2006	EXAMINER	
OKAMOTO & BENEDICTO, LLP P.O. BOX 641330 SAN JOSE, CA 95164			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER
			1753	
DATE MAILED: 02/07/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/735,987

Applicant(s)

JULIANO ET AL.

Examiner

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 15, 17, 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Pearson (U.S. Pat. 6,132,576).

Regarding claim 15, Pearson teach a method of magnetron sputtering by providing a target 7 and sputtering the target with ions of an open plasma loop. (See Fig. 7; Column 5 lines 32-43-45) Fig. 7 shows an open plasma loop. (Column 5 lines 11-18)

Regarding claim 17, the target is a planar target 7. (See Figure 1)

Regarding claim 18, the magnetic field can be rotated. (Column 5 lines 36-40)

Claims 26-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Lai et al. (U.S. Pat. 6,179,973).

Regarding claim 26, Lai et al. teach forming a closed plasma loop in a magnetron sputtering chamber. Lai et al. teach forming an open plasma loop in Fig. 3 having a beginning on a path defined by the closed plasma loop and an end defined on an end region of the chamber. (See Fig. 3)

Regarding claim 27, the region includes the path defined by the closed plasma loop. (See Fig. 3)

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Regarding claim 28, the region comprises a volume of the chamber that is not on a path of a plasma loop. (See Fig. 3)

Regarding claim 29, the region includes a path of a second open loop plasma. (See Fig. 3)

Regarding claim 30, Fig. 3 shows formation of a second open plasma loop with the second open plasma loop having a beginning on the path defined by the closed plasma loop and an end on path defined by the first open plasma loop. (See Fig. 3)

Regarding claim 31, Fig. 3 shows forming a third open plasma loop, the third open plasma loop having a beginning on the path defined by the closed plasma loop and an end on a path defined by the second open loop plasma loop. (See Fig. 3)

Regarding claim 32, Magnetic field lines 108 also known as the separatrix, is the boundary between field lines 101 and field lines 102. (Column 3 lines 31-35)

Claims 22, 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Kastanis et al. (U.S. Pat. 6,432,285).

Regarding claims 22, 23 and 25, Kastanis et al. teach in Fig. 6 a magnetron sputtering method in which the magnetic poles are arranged to create first, second and third separatrices. The separatrices would inherently produce the null region from which ions would escape. The target 12 is a planar target. (See Fig. 6)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-4, 8-10, 12, 14, 15, 19, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pearson (U.S. Pat. 6,132,576).

Regarding claims 1, 9, Pearson teach a method and apparatus of magnetron sputtering utilizing a first closed plasma loop. (See Fig. 5) A target is sputtered with ions. (Column 5 lines 43-45)

Regarding claims 4, 10, the target is planar target 7. (See Fig. 1)

Regarding claims 8, 12, 21, the magnetic field can be rotated in a magnetic array. (Column 5 lines 36-40)

Regarding claim 14, the magnets can be oriented perpendicular to the target surface. (See Fig. 3)

The differences between Pearson and the present claims is that utilizing an open loop plasma in the closed loop plasma is not discussed (Claims 1, 9, 19), the second open plasma loop in the first plasma loop is not discussed (Claims 2, 20), the open plasma loop flowing in the same direction as the first plasma loop is not discussed (Claim 3),

Regarding utilizing the open loop plasma within the closed loop plasma (Claims 1, 9, 19), Pearson suggest various plasma zone shapes and that a variety of plasma zone shapes can be created by positioning the magnets. The plasma zone shapes are shown in Figs. 4-6. (Column 5 lines 10-18) Given that Pearson suggest utilizing various plasma zone shapes by positioning magnets one of ordinary skill in the art would envisage combining the open plasma zone shape of Figure 7 with the closed loop plasma zone shape of Figure 5 in order to have a open plasma zone shape within the closed plasma zone shape for eroding a sputter target. (See Figures 5 and 7)

Regarding claims 2, 20, Figure 5 shows a second closed plasma loop within the first closed plasma loop. (See Figure 5)

Regarding claim 3, the first and second plasma loops would flow in the same direction upon positioning of the magnets. (Column 5 lines 11-18)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized different plasma zones as taught by Pearson because it allows for producing uniformly deposited films.

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Claims 1, 5-7, 9, 11, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pearson (U.S. Pat. 6,132,576) in view of Lai et al. (U.S. Pat. 6,179,973).

Pearson is discussed above and all is as applies above. (See Pearson discussed above)

The difference between Pearson and the present claims is utilizing a hollow cathode target is not discussed and the separatrix is not discussed.

Lai et al. is discussed above and teach utilizing a hollow cathode target in conjunction with a magnetron and a separatrix. (See Abstract)

The motivation for utilizing a hollow target is that it allows for achieving high ionization, good step coverage and good process uniformity. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Pearson by utilizing a hollow target as taught by Lai et al. because it allows for achieving high ionization, good step coverage and good process uniformity.

Claims 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pearson (U.S. Pat. 6,132,576) in view of Gung (U.S. Pat. 6,491,801).

Pearson is discussed above and all is as applies above. (See Pearson discussed above)

The difference between Pearson and the present claims is that the use of a magnet oriented parallel to the target surface is not discussed.

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Gung teach that in a magnetic circuit magnets can be oriented parallel to a surface of the target 14 wherein the first set of magnets generate an open plasma loop. (See Fig. 6)

The motivation for utilizing a magnet oriented to the target surface is that it allows for generating a plasma loop. (See Fig. 6)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Pearson by utilizing a magnet oriented parallel to the target surface as taught by Gung because it allows for generating a plasma loop.

Claims 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kastanis et al. (U.S. Pat. 6,432,285) in view of Lai et al. (U.S. Pat. 6,179,973).

Kastanis et al. is as applies above and all is as applies above. (See Kastanis et al. discussed above)

The difference between Kastanis et al. and the present claims is utilizing a hollow cathode target is not discussed.

Lai et al. is discussed above and teach utilizing a hollow cathode target in conjunction with a magnetron. (See Abstract)

The motivation for utilizing a hollow target is that it allows for achieving high ionization, good step coverage and good process uniformity. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Kastanis et al. by utilizing a hollow target



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as taught by Lai et al. because it allows for achieving high ionization, good step coverage and good process uniformity.

***Response to Arguments***

Applicant's arguments filed November 23, 2005 have been fully considered.

In response to the argument that Gung does not teach an open loop plasma within a closed loop plasma, it is agreed that Gung does not teach an open loop plasma within a closed loop plasma. Pearson newly cited is believed to at least suggest combining an open loop plasma (i. plasma zone) with a closed loop plasma (i.e. plasma zone). This is done by configuring magnets in holes of the magnet mounting plate. (See Pearson discussed above)

In response to the argument that Lai does not teach plasma loops, it is argued that the magnetic fields inherently have plasma loops and therefore suggest Applicant's plasma loops. (See Lai discussed above)

In response to the argument that Kastanis does not teach a null region through ion may escape to be deposited on a substrate, it is argued that Kastanis teach producing three separatrixes which would inherently produce a null region from which ions would escape. (See Kastanis discussed above)

In response to the argument that Lai does not teach separatrix configurations that result in the formation of the open plasma loop, Lai teach a separatrix in Column 3 lines 31-35 that will result in Applicants formation of an open plasma loop. (See Lai discussed above)

This action will be made NON-Final based on the newly cited art.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
February 1, 2006